



EA Engineering, Science, and Technology, Inc., PBC

405 S. Highway 121, Suite C-100
Lewisville, TX 75067
Telephone: 972-315-3922
Fax: 972-315-5181
www.eaest.com

27 February 2017

Ms. Katrina Higgins-Coltrain
Task Order Monitor
U.S. Environmental Protection Agency (EPA) Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

RE: Wetland Delineation Report
Wilcox Oil Company Superfund Site
Remedial Investigation/Feasibility Study
Remedial Action Contract 2
Contract: EP-W-06-004
Task Order 0128-RICO-06GG

Dear Ms. Higgins-Coltrain:

EA Engineering, Science, and Technology, Inc., PBC (EA) is enclosing one electronic copy via email of the Wetland Delineation Report Rev01, for the above-referenced Task Order. Rev01 includes revisions based upon comments received from EPA on 6 February 2017. This document will also be included as an attachment in the Remedial Investigation Report.

An electronic copy is also being emailed to Mr. Todd Downham at Oklahoma Department of Environmental Quality (ODEQ).

Please do not hesitate to contact me at (972) 459-5038 if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'Patrick Appel', is enclosed in a rectangular box.

Patrick Appel
Project Manager

cc: Todd Downham, ODEQ Project Manager (e-mail copy)
Tim Startz, EA Program Manager (letter only)
File



Wetland Delineation Report Wilcox Oil Company Superfund Site Bristow, Creek County, Oklahoma

Prepared for

U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
405 S. Highway 121
Building C, Suite 100
Lewisville, Texas 75067
(972) 315-3922

February 2017
Revision: 01

This page intentionally left blank

TABLE OF CONTENTS

	<u>Page</u>
1. INTRODUCTION	1
2. RESEARCH OF AVAILABLE DOCUMENTS.....	1
2.1 SITE BACKGROUND.....	1
2.2 UNITED STATES GEOLOGICAL SURVEY TOPOGRAPHIC MAP.....	1
2.3 SOIL SURVEY INFORMATION.....	1
2.4 NATIONAL WETLAND INVENTORY MAP	2
3. METHODOLOGY	2
3.1 HYDROPHYTIC VEGETATION	3
3.2 HYDRIC SOILS	4
3.3 WETLAND HYDROLOGY	4
3.4 STREAM CHANNELS	4
3.5 FIELD DATA COLLECTION	5
3.6 FIELD DELINEATION	5
4. SYSTEMS IDENTIFIED	6
4.1 WETLAND 1	6
4.2 WETLAND 2.....	6
4.3 WETLAND 3.....	7
4.4 WETLAND 4.....	7
4.5 WUS 1.....	7
4.6 WUS 2.....	7
4.7 WUS 3.....	7
4.8 WUS 4.....	8
4.9 WUS 5.....	8
4.10 WUS 6.....	8
4.11 WUS 7.....	8
5. CONCLUSION.....	9
6. REFERENCES	10
APPENDIX A: FIGURES	
APPENDIX B: WETLAND DATA SHEETS	
APPENDIX C: PHOTO LOG	

LIST OF ACRONYMS AND ABBREVIATIONS

AOR	Area of review
bgs	below ground surface
EA	EA Engineering, Science, and Technology, Inc., PBC
EPA	U.S. Environmental Protection Agency
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
ft	foot (feet)
in.	inch(es)
lf	linear feet
NAD83	North American Datum of 1983
NRCS	National Resource Conservation Service
NWI	National Wetlands Inventory
OBL	Obligate Wetland
OHWM	Ordinary High Water Mark
PEM	Palustrine Emergent
PFO	Palustrine Forested
PSS	Palustrine Scrub-Shrub
SOW	Scope of Work
TO	Task Order
UPL	Upland
WET1	Wetland 1
WET2	Wetland 2
WET3	Wetland 3
WET4	Wetland 4
WUS	Waters of the United States
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) received the Statement of Work (SOW) for the Wilcox Oil Company Superfund Site (site) from the U.S. Environmental Protection Agency (EPA) under Remedial Action Contract No. EP-W-06-004, Task Order No. 0128-RICO-06GG. Under this Task Order (TO), EA is authorized to implement the remedial investigation/feasibility study for the Site. Prior to implementation of remedial activities, EA conducted a review and delineation of the wetlands and/or “waters of the United States” located within and adjacent to the site.

2. RESEARCH OF AVAILABLE DOCUMENTS

2.1 SITE BACKGROUND

The Wilcox Oil Company Superfund Site (site) is located on E0810 Road (aka West 221st Street), just east of Route 66 in Bristow, Creek County, Oklahoma (Figure 1). The site is an abandoned and demolished oil refinery and associated tank farm. The geographic coordinates of the approximate center of the site are approximately 35°50’31” north latitude and 96°23’02” west longitude. The site includes remnants of former oil refining operations and tank farms. For planning purposes, the site was divided into five major former operational areas: the Wilcox and Lorraine Process Areas, the East and North Tank Farms, and the Loading Dock Area (Figure 2). The area of review (AOR) for this report includes the Lorraine Process Area, Wilcox Process Area, East Tank Farm, and the southern portion of the North Tank Farm.

Prior to conducting the wetland delineation in the field, relevant site-specific data for the habitat evaluation area was reviewed to identify the likely location of potential wetlands and streams.

2.2 UNITED STATES GEOLOGICAL SURVEY TOPOGRAPHIC MAP

The United States Geological Survey (USGS) topographic map for the AOR (Figure 3) was used as a reference to identify possible wetlands and waterways on the property. Topographic maps identify elevations, forested areas, streams, ponds, roads and structures. The USGS topographic map depicts three blue-line streams including Sand Creek. In general, the topography of the site slopes to the south with two valleys oriented north-south associated with blue-line streams. The USGS topographic map also depicts a railroad on the site along the eastern boundary of the North Tank Farm and Lorraine Process Area.

2.3 SOIL SURVEY INFORMATION

The online National Resource Conservation Service’s (NRCS) Web Soil Survey for Creek County was reviewed for the AOR (Figure 4). The Soil Survey identifies seven soil mapping units within the site and are identified in the Table 1. According to the Soil Survey, no hydric soil units occur within the site.

Table 1 Area of Review Soils

SOIL MAPPING UNIT	SYMBOL	HYDRIC SOIL	ACRES
Port silt loam, 0 to 1 percent slopes, occasionally flooded	Ve	Not Hydric	0.18
Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded	Vd	Not Hydric	14.42
Dale clay loam, 0 to 1 percent slopes, rarely flooded	Ma	Not Hydric	3.27
Bartlesville-Bigheart complex, 1 to 8 percent slopes, severely eroded	BBgD3	Not Hydric	10.94
Ashport silt loam, 0 to 1 percent slopes, frequently flooded	Ga	Not Hydric	7.08
Bigheart-Niotaze-Rock outcrop complex, 1 to 8 percent slopes	BNRD	Not Hydric	78.99
Oil waste land-Huska complex, 1 to 8 percent slopes	Oa	Not Hydric	20.33
Source: Adapted from the USDA-NRCS Web Soil Survey			

2.4 NATIONAL WETLAND INVENTORY MAP

EA's wetland scientist reviewed wetland data from the United States Fish and Wildlife (USFWS) Service's National Wetlands Inventory (NWI) Mapper. The NWI Map (Figure 5) identifies a total of nine NWI wetlands within the AOR, consisting of one freshwater forest/shrub wetland, three riverine wetlands, and five freshwater ponds within the AOR, which are each classified with a Cowardin designation. Table 2 below provides a list of the NWI wetland types identified within the site.

Table 2 NWI Wetlands within Site Boundary

NWI CODE	COWARDIN DESIGNATION
PFO1A	Palustrine Forested, Broad-Leaved Deciduous, Temporary Flooded
R2UBH	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
R4SBC	Riverine, Intermittent, Streambed, Seasonally Flooded
PUBHh	Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded
Source: Adapted from the NWI Map	

3. METHODOLOGY

The wetland delineation was conducted in accordance with the "Routine Determination" procedures outlined in the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0) (U.S. Army Engineer Research and Development Center 2010). This approach is based on the presence of three parameters (i.e., wetland hydrology, hydric soils, and hydrophytic vegetation) including indicators, delineation guidance, and other information that is specific to the Great Plains Region. The United States Army Corps of Engineers (USACE) technical guidance for identifying wetlands requires that a

positive wetland indicator be present for each of the three identified parameters except in limited instances identified as an atypical situation.

3.1 HYDROPHYTIC VEGETATION

Hydrophytic vegetation is defined in the USACE manual as a community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant occurrence. A plant-community approach to evaluate vegetation is used and therefore hydrophytic vegetation decisions are based on the community of plant species growing in a particular area rather than the presence or absence of particular indicator species. Common wetland plant species have been categorized regionally by the USACE in the 2016 National Wetland Plant List (Lichvar, 2016). Each plant is classified into one of five categories as follows:

- Obligate (OBL) = Greater than 99 percent estimated probability of occurring in wetlands.
- Facultative Wetland (FACW) = 67 to 99 percent estimated probability of occurring in wetlands.
- Facultative (FAC) = 34 to 66 percent estimated probability of occurring in wetlands.
- Facultative Upland (FACU) = 1 to 33 percent estimated probability of occurring in wetlands.
- Upland (UPL) = less than 1 percent estimated probability of occurring in wetlands.

Plants that have an indicator status of OBL, FACW, or FAC are considered to be typically adapted for life in anaerobic soil conditions. When the dominant species in a plant community are typically adapted for life in anaerobic soil conditions, hydrophytic vegetation is present. Several indicators may be used to determine whether hydrophytic vegetation is present on a site; however, the presence of a single individual of a hydrophytic species does not mean that hydrophytic vegetation is present.

Evaluation of the vegetation begins with a rapid field test for hydrophytic vegetation to determine if there is a need to collect more detailed vegetation data. If the area is not dominated solely by OBL and FACW species, the standard dominance test is performed to determine if more than 50 percent of the dominant species are OBL, FACW, or FAC. Some wetland plant communities may not be considered hydrophytic based only on dominant species. Therefore, in those cases where indicators of hydric soil and wetland hydrology are present, the vegetation would be reevaluated with the prevalence index test taking into account non-dominant plant species as well. A plant community is considered hydrophytic if one of these three tests are passed.

3.2 HYDRIC SOILS

Hydric soils are soils that are saturated, ponded, or flooded long enough during the growing season to develop anaerobic conditions in the upper portion of the soil column (typically within the upper 18 in.). The prolonged presence of water results in the chemical reduction of elements, particularly iron and manganese. Reduced soils often exhibit a gray (or “gleyed”) color that reflects either the leaching of elements or the presence of reduced elements (again, generally iron and manganese).

Hydric soils are often characterized by bright mottles, sometimes called redoximorphic features. Mottles are an indication of incomplete saturation. They typically represent isolated pockets where elements (mainly iron) have remained oxidized. Another feature of hydric soils is a low matrix chroma in the diagnostic zone, which is typically identified as the upper 18-inches of the soil layer, but may vary. For mineral hydric soils, the diagnostic zone typically must have a matrix chroma of two or less (for soils with mottles), or a matrix chroma of one or less (for soils without mottles). To make this determination, soil cores are collected in the field in suspected wetland areas and the soil colors are compared to a Munsell Soil Color Chart. Other examples of field indicators for hydric soils include, but are not limited to, high organic content, histic epipedons, sandy redox, and/or depletions and are defined in the Regional Supplement to the Wetland Delineation Manual.

3.3 WETLAND HYDROLOGY

Wetland hydrology supplies the moisture required to support wetland vegetation and also creates the conditions necessary for the formation of hydric soils. Primary indicators of wetland hydrology include, but are not limited to, observed inundation or saturation, watermarks, drift deposits, sediment deposits, and water stained leaves. Secondary indicators of wetland hydrology include, but are not limited to, drainage patterns, soil cracks, crayfish burrows, and the FAC-Neutral test. The FAC-Neutral test involves comparing the number of OBL and FACW plant species to the number of FACU and UPL plant species, with FAC species being neutral. If 50 percent or more of the plant species are OBL or FACW, the FAC-Neutral test is considered a secondary indicator of wetland hydrology. An area must contain at least one primary indicator or two secondary indicators of wetland hydrology for the criterion of wetland hydrology to be met.

3.4 STREAM CHANNELS

In addition to identifying wetlands, stream channels were flagged that would likely be considered jurisdictional Waters of the U.S. (WUS) stream channels were identified by the presence of a defined bed and bank, as well as a defined ordinary high water mark (OHWM). Furthermore, identified stream channels were classified into one of three categories: perennial stream channels that typically flow year-round, intermittent stream channels that only flow seasonally, and ephemeral stream channels that typically flow less than seasonally. Ephemeral channels receive hydrology from surficial sources such as runoff from surrounding uplands during and immediately following precipitation events and/or snow melt (i.e., do not have a direct

connection to groundwater and are not hydraulically connected to wetlands). Desktop information such as USGS maps, soil surveys, NWI maps, and other materials were used to assist in classifying stream channels in addition to observations made during the site visits.

3.5 FIELD DATA COLLECTION

Locations for collection of data were established on-site to evaluate the presence or absence of jurisdictional wetlands/waterways, and to demonstrate the typical characteristics of uplands and wetlands along the line of delineation. Surrounding vegetative species and hydrologic indicators were observed at the sample locations. EA personnel collected soil to a depth of approximately 16 in. or until refusal was encountered to observe soil conditions and classify the soil as either hydric or non-hydric. Routine wetland determination data sheets were used to summarize observations on vegetation, soils, and hydrology for both the wetland and upland sample plots. Copies of these Wetland Data Sheets are included in Appendix B. Additionally, on-site photographs of the wetlands and streams identified were collected in the field and are included in Appendix C.

3.6 FIELD DELINEATION

On 19 through 22 October 2016, EA's wetland scientist and engineer performed a field delineation of the site and immediate surroundings (defined as the AOR) in order to evaluate whether wetlands and/or waterways were present. The AOR encompasses approximately 135 acres including the Lorraine Process Area, the Wilcox Process Area, the East Tank Farm, and the southern portion of the North Tank Farm (Figure 2). The field delineation of WUS consisted of identifying the limits of the wetlands and waterways with pink and black flagging, which were numbered sequentially. Wetland flag locations were located in the field with a handheld Trimble GeoXT GPS unit with sub-meter horizontal accuracy and collected in the North American Datum of 1983 (NAD83), Oklahoma State Plane North Coordinate System. The field-mapped wetland/upland boundaries are shown on Figures 6 through 9 which are overlaid onto an aerial photograph. Table 3 presents a summary of systems identified.

Table 3 Systems Identified Within the Area of Review

SYSTEMS	TYPE	SIZE (ac)	LENGTH (LF)
WET1	PFO/PEM	0.06/0.03	--
WET2	POW/PSS	0.09/0.15	--
WET3	PEM	0.24	--
WET4	PSS	0.02	--
WUS1	Intermittent	--	130
WUS2	Perennial	--	2,110
WUS3	Intermittent	--	335
WUS4	Intermittent	--	70
WUS5	Perennial	--	2,315
WUS6	Perennial	--	235
WUS7	Ephemeral		3,075
ac – acres lf – linear feet			

4. SYSTEMS IDENTIFIED

4.1 WETLAND 1

Wetland 1 (WET1) is a small isolated wetland located in the southeastern portion of the Wilcox Process Area (Figure 7). The primary source of hydrology for WET1 is believed to be surficial runoff and surface water was observed in WET1 during the delineation. WET1 contains palustrine emergent (PEM) vegetation in the southwest portion and palustrine forest (PFO) vegetation in the northeast portion of the wetland. A wetland data point was collected in the PEM portion of the wetland. The PEM portion of WET1 consists of predominantly hydrophytic vegetation including narrow leaf cattail (*Typha angustifolia*). The PFO portion of WET1 was dominated by black willows (*Salix nigra*) and green ash (*Fraxinus pennsylvanica*). WET1 did not display hydric soils, however much of the Wilcox Process Area was an industrial site and it is likely that the soils in this area have been disturbed.

4.2 WETLAND 2

Wetland 2 (WET2) is located in line with WUS3 and WUS7 and was likely man made by excavating the lower portion of WUS7 and building a dam to create a farm pond (Figure 7). WET2 is a perennial open water with a palustrine scrub-shrub (PSS) fringe wetland. At the time of the delineation water levels were low exposing an unvegetated mud flat. Hydrophytic vegetation within the PSS portion of WET2 includes water purslane (*Ludwigia palustris*), black willow, button bush, sweetscent (*Pluchea odorata*). The soil at the WET2 data point was saturated at the surface and the water table was observed at 12 in. below ground surface (bgs). The soil profile within WET2 displayed a depleted matrix. Unlike other impoundments located within the AOR, WET2 is likely jurisdictional since it was created by impounding WUS7 (discussed in Section 4.11) and would be considered an in-line feature.

4.3 WETLAND 3

WET3 is located north of E0810 Rd within the North Tank Farm Area (Figure 8). WET3 is a system of vegetated drainage ditches that connect to WUS1 through a culvert under E0810 Rd. WET3 is dominated by hydrophytic including black willow, narrow leaf cattail, and common boneset (*Eupatorium perfoliatum*). A complete soil profile within WET3 could not be obtained due to the presence of a restrictive layer at 6 in. bgs. Hydrology for WET3 included surface water and inundation visible from aerial imagery.

4.4 WETLAND 4

WET4 is small PEM wetland located along WUS5 (Figure 9). The soil matrix within this area had a chroma value of less than two as well as redox features in the pore linings. Saturation was observed at 4 in. bgs and the water table was observed at 12 in. bgs. WET4 was dominated by hydrophytic vegetation including river birch (*Betula nigra*), slippery elm (*Ulmus rubra*), American sycamore (*Platanus occidentalis*), horsetail (*Equisetum* spp.) and marsh fleabane (*Pulchea odorata*).

4.5 WUS 1

WUS1 is an intermittent channel originating at E0810 Rd (Figure 6) west of the Lorraine Process Area. The banks of WUS1 are highly eroded and the channel contained large amounts of trash and debris. WUS1 was likely at one time an ephemeral channel, however due to erosion from high flows, WUS1 has been cut down. Its connection to ground water may be determined in future investigations. WUS1 conveys flow in a southerly direction where it contributes to WUS2.

4.6 WUS 2

WUS2 is a wide, low gradient perennial channel that generally follows along the southwestern boundary of the site (Figure 6). WUS2 is shown on USGS topographic maps as a blue line stream and is identified as Sand Creek (Figure 3). Approximately 2,110 ft along left bank of WUS2 was delineated. Channel widths were collected at various data points and used in conjunction with aerial imagery to approximate the right bank. The dominate substrate of WUS2 is hard clay with finer materials observed in bars located along the banks throughout the channel. Vegetation along WUS2 included a mix of native and non-native species including American sycamore, catalpa (*Catalpa* spp.), Chinese privet (*Ligustrum sinense*), cardinal flower (*Lobelia cardinalis*), beefsteak (*Perilla frutescens*), green briar (*Smilax rotundifolia*), and multiflora rose (*Rosa multiflora*). Wildlife observed included small fish, frogs and turtles. Pollutants observed within WUS2 include trash, debris, and a petroleum odor.

4.7 WUS 3

WUS3 is an intermittent channel located in the southern portion of the Wilcox Process Area (Figure 7). WUS3 originates below a concrete apron at the south end of WET2 and flows south to connect with WUS2. WUS3 is approximately 3 ft wide and 6 ft deep with an average water

depth of less than 6 in. The banks of WUS3 are very steep due to erosion during high flow events.

4.8 WUS 4

WUS4 is a low gradient intermittent channel located in the southern portion of the Wilcox Process Area originating from a seep below WET2 (Figure 7). WUS4 is approximately 3 ft wide and 2 ft deep with less than 1 in. of water at the time of the field delineation. WUS4 has a muck bottom and an orange sheen indicating the presence of iron.

4.9 WUS 5

WUS5 is a low gradient perennial channel located in the East Tank Farm Area along the eastern portion of the AOR (Figure 6). WUS5 is shown on USGS topographic maps as a blue line stream (Figure 3) and originates from an impoundment located north of the site. At the time of the field delineation, a culvert that carries overflow from the impoundment to WUS5 was being replaced. A large storm earlier in the year had damaged the culvert and impoundment dam. Signs of erosion due to the high flows during the storm were observed along the upper reach of WUS5. WUS5 is approximately 2,315 linear ft and an average of 25 ft wide. The substrate of WUS5 consisted of silty sand and bedrock in the upper reach and hard clay in the lower reach. Debris and a sheen were observed throughout WUS5.

4.10 WUS 6

WUS6 is small, low gradient perennial channel that originates offsite and conveys flow to WUS5 near the southwest corner of the AOR (Figure 6). WUS6 is approximately 5 ft wide and 4 ft deep with approximately 1 ft of water.

4.11 WUS 7

WUS7 is an ephemeral channel that flows north to south through the Wilcox Process Area (Figure 6). WUS7 is shown on USGS topographic maps as a blue line stream, however due to dense overgrowth could not be field delineated. WUS7 was instead delineated using aerial imagery and the USGS topography. WUS7 originates north of the AOR and flows south to connect with WET2. It is likely that WUS7 and WUS3 were one stream prior to the impoundment that created WET2.

5. CONCLUSION

The seven WUS and three wetlands identified within the AOR, in EA's opinion, either exhibited characteristics of regulated waterways or all three wetland parameters as defined in the 2012 Regional Supplement Manual. These areas were identified in the field and mapped on the Figures 6 through 9. One wetland, WET1, displayed only two wetland parameters and therefore may not be considered jurisdictional by the USACE. WET1 did not display hydric soils, however soils throughout the AOR are highly disturbed from historic processing activities and may be considered problematic soils.

During the delineation, several non-jurisdictional features were observed within the AOR. Non-jurisdictional features included four impoundments in the East Tank Farm Area and several erosional features in the eastern portion of the East Tank Farm that likely resulted from the large storm earlier in 2016. Additionally, several impoundments and one wetland shown on the NWI map were not observed during the delineation. NWI maps are created using high altitude imagery and wetlands are identified by vegetation, visible hydrology, and geography. Due to the limited accuracy, ground inspection of NWI maps is necessary to determine their accuracy. During the field investigation, four impoundments were identified, only one of which corresponds to an NWI impoundment. The remaining impoundments shown on the NWI map were not observed.

It is EA's professional opinion that there are jurisdictional nontidal wetlands and WUS present within the AOR. However, the USACE is the federal agency that determines the official jurisdictional status of wetlands/waterways. Should it be necessary, this report, including appendices, can be submitted to the USACE to assist with preliminary or final Jurisdictional Determination.

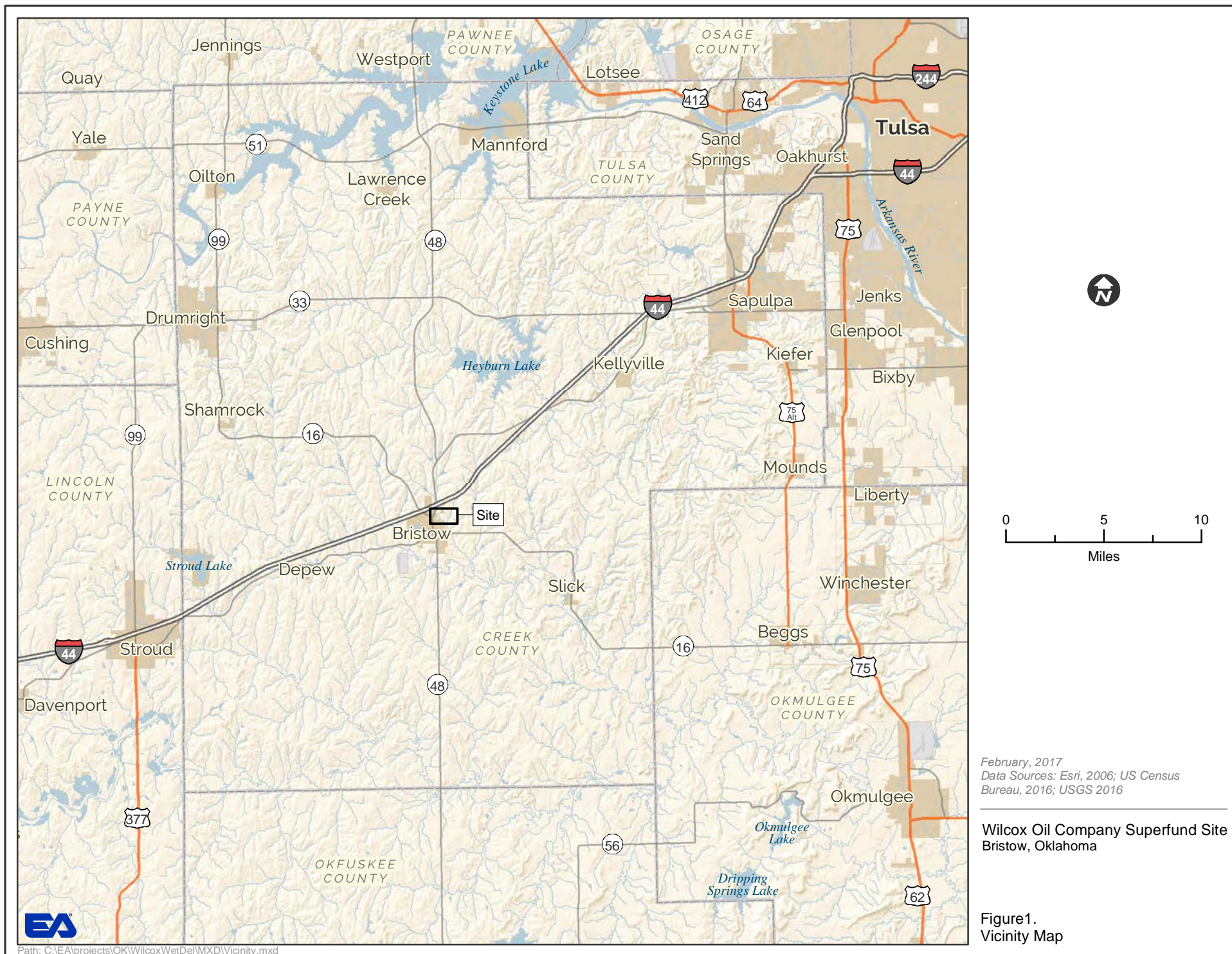
6. REFERENCES

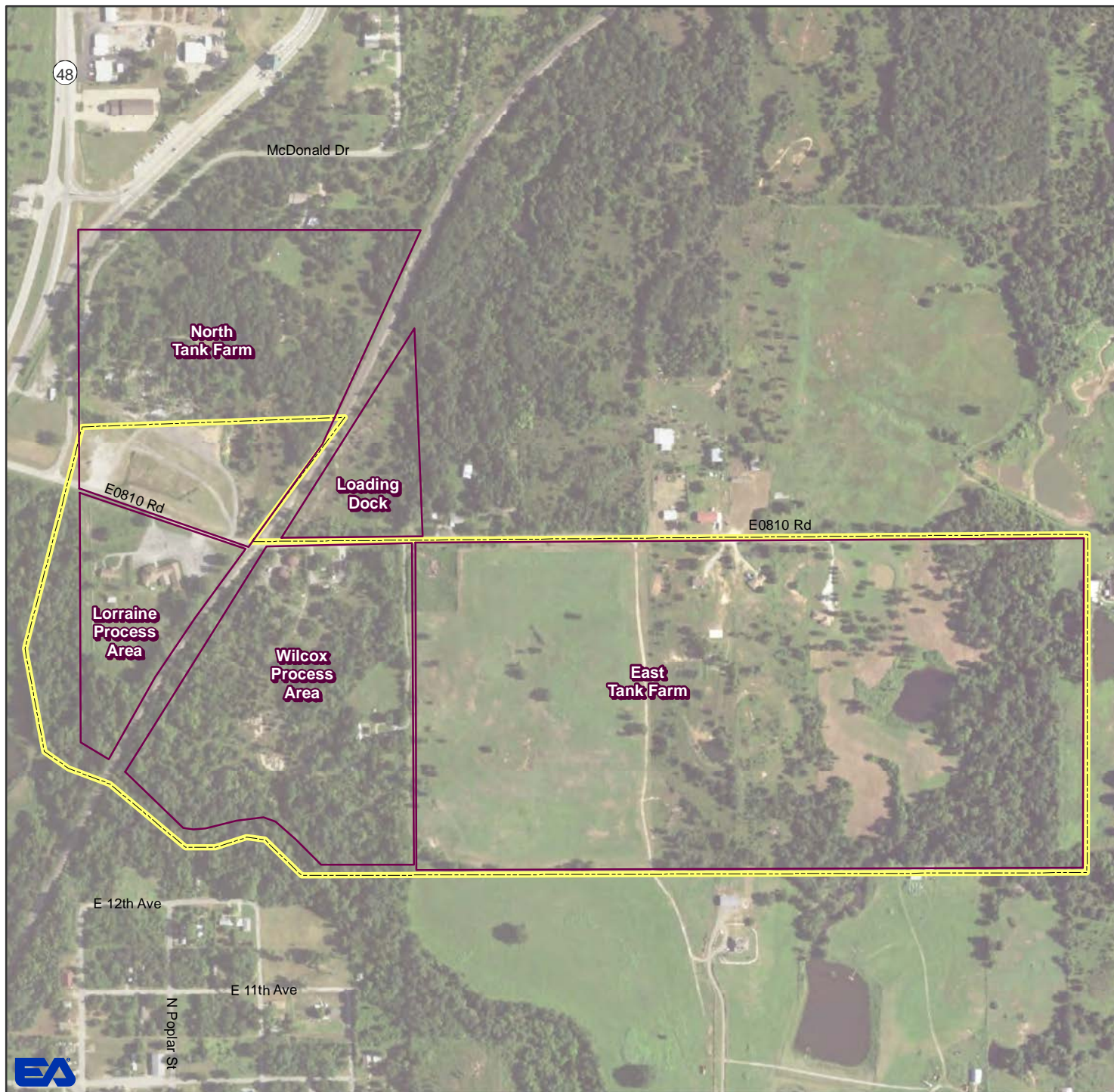
- Cowardin, L.M., V. Carter, F. Golet and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. United States Department of the Interior, USFWS, Washington, D.C.
- Environmental Laboratory. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region. Version 2.0*. U.S. Army Engineer Research and Development Center, Vicksburg, MS.
- Kollmorgen Instruments Corporation. 1988. *Munsell Soil Color Charts*, Baltimore, Maryland.
- Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings*. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X
- National Resources Conservation Service (NRCS). 2016. *Hydric Soils List By State*. <<http://soils.usda.gov/use/hydric/lists/state.html>>. Accessed December 15, 2016.
- United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). 2015. *Web Soil Survey*. <<http://websoilsurvey.nrcs.usda.gov>>
- United States Fish and Wildlife Service (USFWS). 2016. *National Wetlands Inventory*. <<http://wetlandsfws.er.usgs.gov>>

Appendix A

FIGURES

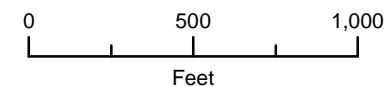
This page intentionally left blank





Legend

- Area of Review
- Source Area

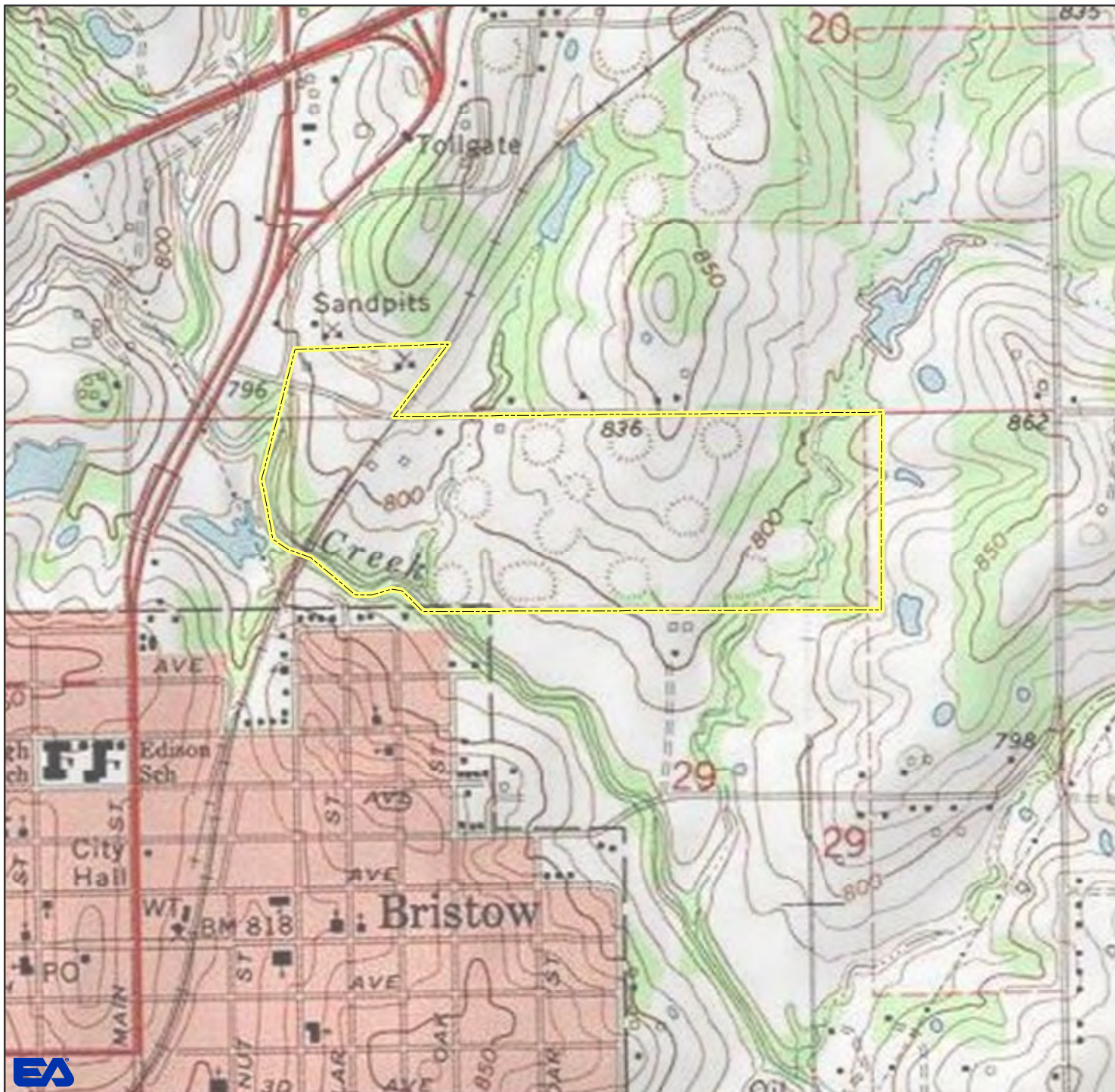


February, 2017
Data Sources: USDA, 2015


Wilcox Oil Company Superfund Site
Bristow, Oklahoma

Figure 2.
Area of Review





Legend

 Area of Review



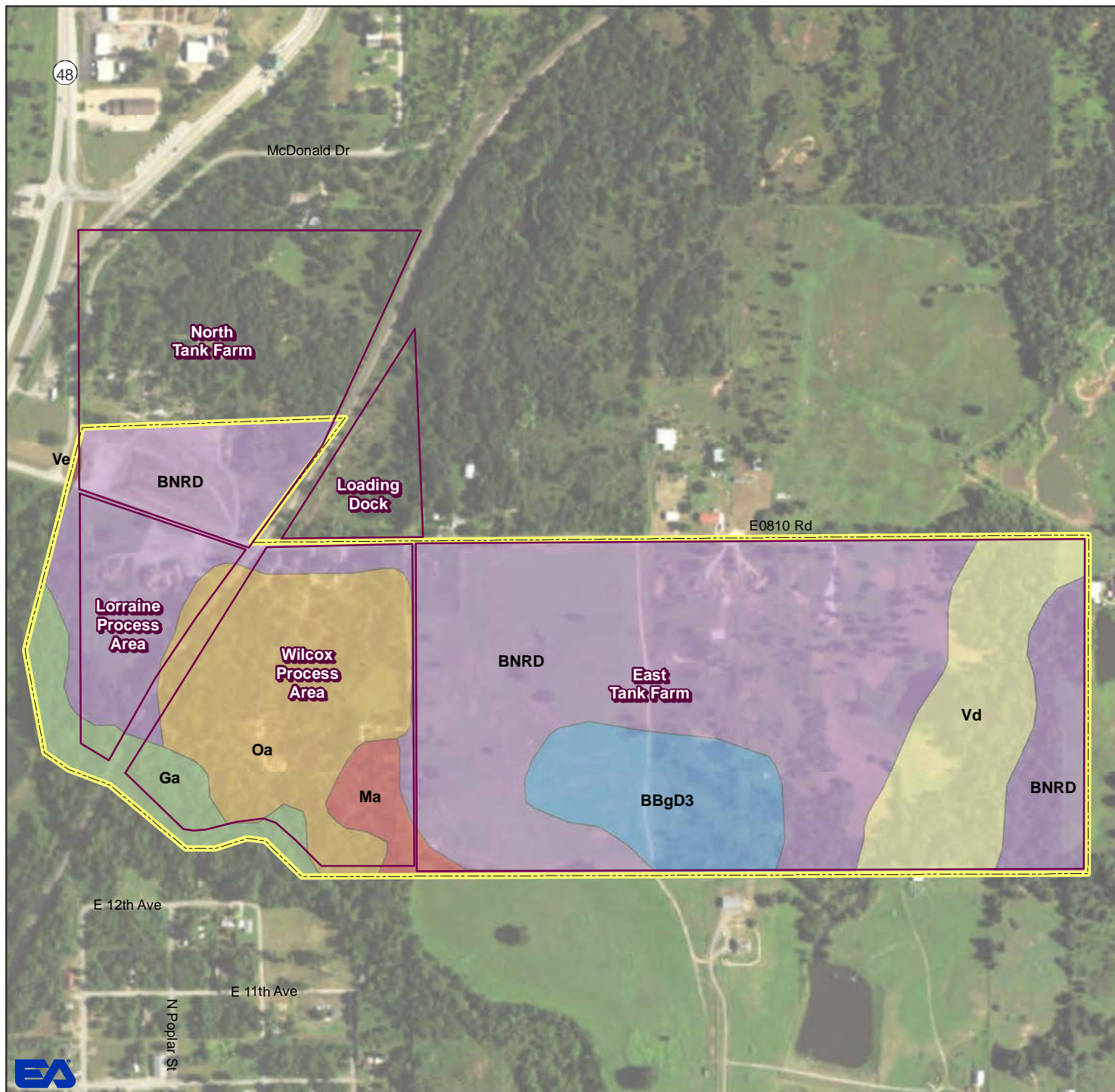
0 500 1,000
Feet

February, 2017
Data Sources: National Geographic Society,
i-cubed, 2013

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

Figure 3.
USGS Topographic Map





Legend

 Area of Review

 Source Area

Soils

Ashport silt loam, 0 to 1 percent slopes, frequently flooded (Ga)

Bartlesville-Bigheart complex, 1 to 8 percent slopes, severely eroded (BBgD3)

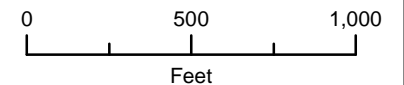
Bigheart-Niotaze-Rock outcrop complex, 1 to 8 percent slopes (BNRD)

Dale clay loam, 0 to 1 percent slopes, rarely flooded (Ma)

Oil waste land-Huska complex, 1 to 8 percent slopes (Oa)

Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded (Vd)

Port silt loam, 0 to 1 percent slopes, occasionally flooded (Ve)



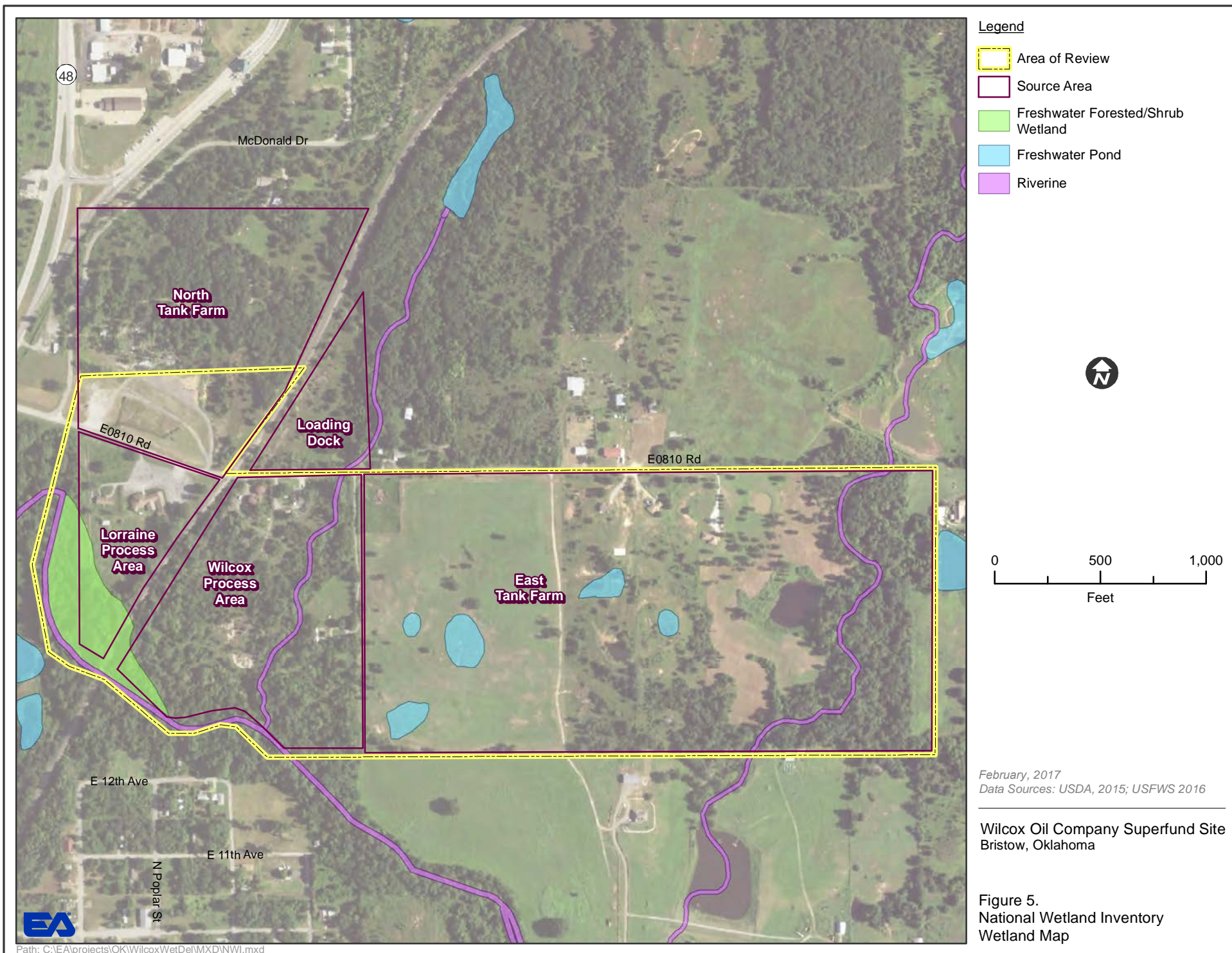
February, 2017

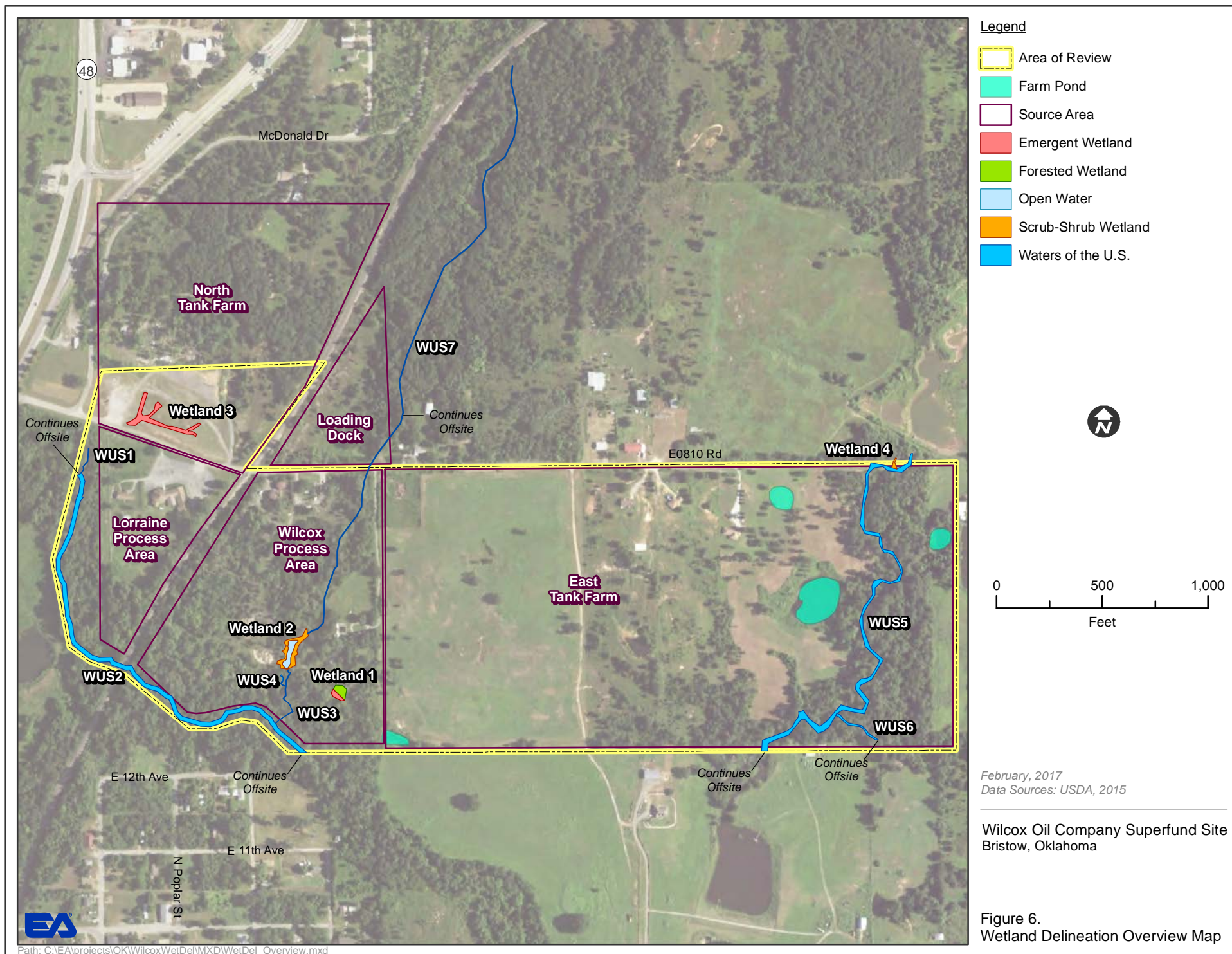
Data Sources: USDA, 2015; USDA NRCS, 2015

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

Figure 4.
USDA NRCS Soil Map



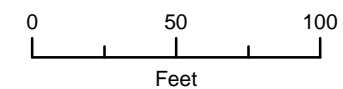






Legend

- Wetland Flag
- Area of Review
- Source Area
- Emergent Wetland
- Forested Wetland
- Open Water
- Scrub-Shrub Wetland
- Waters of the U.S.



February, 2017

Data Sources: USDA, 2015

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

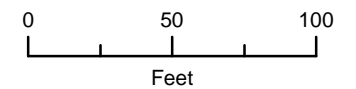
Figure 7.
Wetland Delineation Detail Map
Wetlands 1 and 2





Legend

- Wetland Flag
- Area of Review
- Source Area
- Emergent Wetland

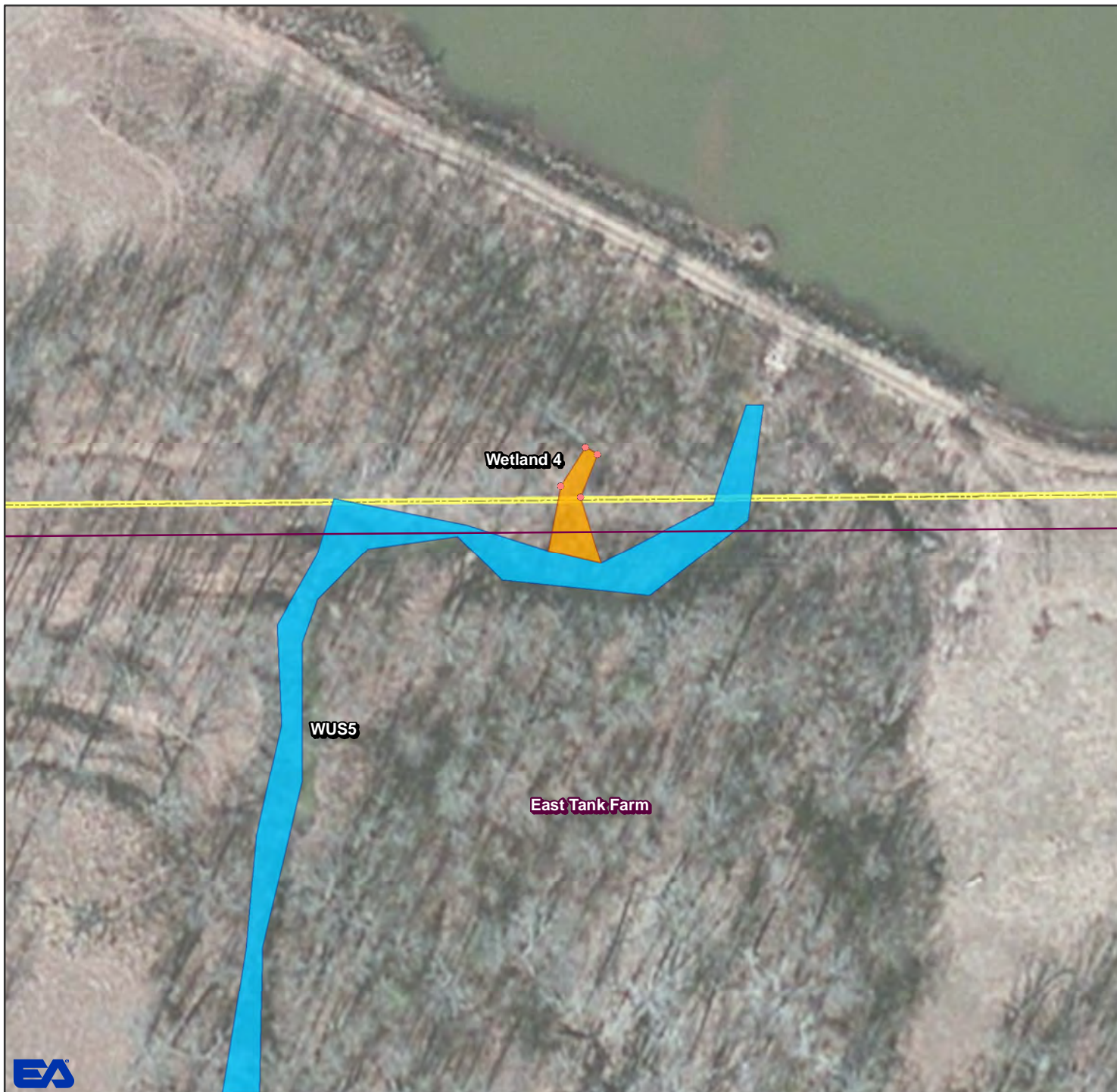


February, 2017
Data Sources: USDA, 2015

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

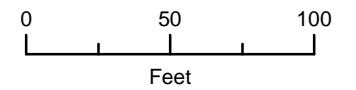
Figure 8.
Wetland Delineation Detail Map
Wetland 3





Legend

- Wetland Flag
- Area of Review
- Source Area
- Scrub-Shrub Wetland
- Waters of the U.S.



February, 2017
Data Sources: USDA, 2015

Wilcox Oil Company Superfund Site
Bristow, Oklahoma

Figure 9.
Wetland Delineation Detail Map
Wetland 4



Appendix B

WETLAND DATA SHEETS

This page intentionally left blank

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wilcox Superfund Site City/County: Bristow Sampling Date: 9/20/2016
 Applicant/Owner: EPA State: OK Sampling Point: WET1
 Investigator(s): K. Rigney, S. Gilrein Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hilly Local relief (concave, convex, none): None Slope (%): 0
 Subregion (LRR): LRR J (Southwestern Prairies) Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Dale clay loam, 0 to 1 percent slopes, rarely flooded NWI classification: PFO/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil X, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes _____ No <u>X</u>	
Wetland Hydrology Present? Yes <u>X</u> No _____	
Remarks: WET1 is an isolated wetland. Due to past site use, soils throughout are significantly disturbed.	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>25'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>None</u>				
2. _____				
3. _____				
4. _____				
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: <u>25'</u>) 1. <u>None</u> 2. _____ 3. _____ 4. _____ 5. _____ _____ = Total Cover				
Herb Stratum (Plot size: <u>5'</u>) 1. <u>Typha angustifolia</u> 30 Y OBL 2. <u>Aster spp.</u> 5 N 3. <u>Carex spp.</u> 10 N 4. <u>Persicaria pensylvanica</u> 10 N FACW 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ 55 = Total Cover				
Woody Vine Stratum (Plot size: <u>5'</u>) 1. <u>None</u> 2. _____ _____ = Total Cover				
% Bare Ground in Herb Stratum <u>45</u>				

Hydrophytic Vegetation Indicators:
 1 - Rapid Test for Hydrophytic Vegetation
 ✓ 2 - Dominance Test is >50%
 3 - Prevalence Index is ≤3.0¹
 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:
 Portion of WET1 is a PFO. Hydrophytic vegetation within PFO includes black willow, green ash, sycamore, and

SOIL

Sampling Point: WET1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	5YR6/4	95	5YR5/8	5	C	M	Fine sand	some clay, moist
4-16	5YR5/8	90	2.5YR4/8	10	C	M	Fine sand	some clay, moist

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Sandy Gleyed Matrix (S4) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Sandy Redox (S5) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Stripped Matrix (S6) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Mucky Mineral (F1) |
| <input type="checkbox"/> Stratified Layers (A5) (LRR F) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | <input type="checkbox"/> High Plains Depressions (F16) |
| <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

Fill, surface is beginning to show signs of depleted matrix

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|---|---|
| <input type="checkbox"/> Surface Water (A1) | <input type="checkbox"/> Salt Crust (B11) |
| <input type="checkbox"/> High Water Table (A2) | <input type="checkbox"/> Aquatic Invertebrates (B13) |
| <input type="checkbox"/> Saturation (A3) | <input type="checkbox"/> Hydrogen Sulfide Odor (C1) |
| <input type="checkbox"/> Water Marks (B1) | <input type="checkbox"/> Dry-Season Water Table (C2) |
| <input type="checkbox"/> Sediment Deposits (B2) | <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) |
| <input type="checkbox"/> Drift Deposits (B3) | (where not tilled) |
| <input type="checkbox"/> Algal Mat or Crust (B4) | <input type="checkbox"/> Presence of Reduced Iron (C4) |
| <input type="checkbox"/> Iron Deposits (B5) | <input type="checkbox"/> Thin Muck Surface (C7) |
| <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) | <input type="checkbox"/> Other (Explain in Remarks) |
| <input type="checkbox"/> Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☒ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____
Water Table Present? Yes _____ No X Depth (inches): _____
Saturation Present? Yes _____ No X Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water present within WET1, depth less than 1 in.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wilcox Superfund Site City/County: Bristow Sampling Date: 9/20/2016
 Applicant/Owner: EPA State: OK Sampling Point: WET2
 Investigator(s): K. Rigney, S. Gilrein Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hilly Local relief (concave, convex, none): Concave Slope (%): 1
 Subregion (LRR): LRR J (Southwestern Prairies) Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Oil waste land-Huska complex, 1 to 8 percent slopes NWI classification: POW/PSS

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil X, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present? Yes <u>X</u> No _____	
Wetland Hydrology Present? Yes <u>X</u> No _____	
Remarks: Ephemeral stream has been excavated and impounded to create pond. Pond now holds water year round and has fringe wetland of button bush, black willow, and hydrophytic forbes.	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>25'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>3</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <u>None</u>				
2. _____				
3. _____				
4. _____				
0 = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
<u>Sapling/Shrub Stratum</u> (Plot size: <u>25'</u>)				
1. <u>Salix nigra</u>	10	Y	FACW	
2. <u>Cephalanthus occidentalis</u>	5	Y	OBL	
3. _____				
15 = Total Cover				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ✓ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
<u>Herb Stratum</u> (Plot size: <u>5'</u>)				
1. <u>Ludwigia palustris</u>	50	Y	OBL	
2. <u>Ageratum houstonianum</u>	2	N	FACU	
3. <u>Juncus effusus</u>	5	N	OBL	
10 = Total Cover				Hydrophytic Vegetation Present? Yes <u>X</u> No _____
4. <u>Pluchea odorata</u>	10	N	FACW	
5. <u>Salix nigra</u>	10	N	FACW	
6. _____				
7. _____				
77 = Total Cover				
<u>Woody Vine Stratum</u> (Plot size: _____)				
1. _____				
2. _____				
3. _____				
0 = Total Cover				
% Bare Ground in Herb Stratum <u>23</u>				
Remarks:				

SOIL

Sampling Point: WET2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	10YR3/3	100					Muck	Decomposing leaves, fine roots
2-18	2.5Y4/2	100					Silty sand	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Sandy Gleyed Matrix (S4) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Sandy Redox (S5) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Stripped Matrix (S6) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Mucky Mineral (F1) |
| <input type="checkbox"/> Stratified Layers (A5) (LRR F) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input checked="" type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | <input type="checkbox"/> High Plains Depressions (F16) |
| <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|---|---|
| <input checked="" type="checkbox"/> Surface Water (A1) | <input type="checkbox"/> Salt Crust (B11) |
| <input type="checkbox"/> High Water Table (A2) | <input type="checkbox"/> Aquatic Invertebrates (B13) |
| <input type="checkbox"/> Saturation (A3) | <input type="checkbox"/> Hydrogen Sulfide Odor (C1) |
| <input type="checkbox"/> Water Marks (B1) | <input type="checkbox"/> Dry-Season Water Table (C2) |
| <input type="checkbox"/> Sediment Deposits (B2) | <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) |
| <input type="checkbox"/> Drift Deposits (B3) | (where not tilled) |
| <input type="checkbox"/> Algal Mat or Crust (B4) | <input type="checkbox"/> Presence of Reduced Iron (C4) |
| <input type="checkbox"/> Iron Deposits (B5) | <input type="checkbox"/> Thin Muck Surface (C7) |
| <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) | <input type="checkbox"/> Other (Explain in Remarks) |
| <input type="checkbox"/> Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____
Water Table Present? Yes X No _____ Depth (inches): 12
Saturation Present? Yes X No _____ Depth (inches): 0
(includes capillary fringe)

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wilcox Superfund Site City/County: Bristow Sampling Date: 9/22/2016
 Applicant/Owner: EPA State: OK Sampling Point: WET3
 Investigator(s): K. Rigney, S. Gilrein Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hilly Local relief (concave, convex, none): Concave Slope (%): 2
 Subregion (LRR): LRR J (Southwestern Prairies) Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Bigheart-Niotaze-Rock outcrop complex, 1 to 8 percent slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil X, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u>	No _____	Is the Sampled Area within a Wetland?	Yes <u>X</u>	No _____
Hydric Soil Present?	Yes <u>X</u>	No _____			
Wetland Hydrology Present?	Yes <u>X</u>	No _____			
Remarks:					

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
_____ = Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____) 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ _____ = Total Cover				
Herb Stratum (Plot size: _____) 1. <u>Typha angustifolia</u> 50 Y OBL 2. <u>Eupatorium perfoliatum</u> 5 N FACW 3. <u>Carex spp.</u> 30 N 4. <u>Aster spp.</u> 5 N 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ 90 = Total Cover				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ _____ = Total Cover				
% Bare Ground in Herb Stratum <u>10</u>				
Remarks:				Hydrophytic Vegetation Indicators: ___ 1 - Rapid Test for Hydrophytic Vegetation ✓ 2 - Dominance Test is >50% ___ 3 - Prevalence Index is ≤3.0 ¹ ___ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ___ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Hydrophytic Vegetation Present? Yes <u>X</u> No _____				

SOIL

Sampling Point: WET3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	10YR3/2	100					Silty Organic	Roots
2-6	10YR6/2	100					Silty Sand	Gravel

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Sandy Gleyed Matrix (S4) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Sandy Redox (S5) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Stripped Matrix (S6) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Mucky Mineral (F1) |
| <input type="checkbox"/> Stratified Layers (A5) (LRR F) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) | <input checked="" type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | <input type="checkbox"/> High Plains Depressions (F16) |
| <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- ☐ (LRR H outside of MLRA 72 & 73)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Coarse gravel
Depth (inches): 6

Hydric Soil Present? Yes X No

Remarks:

Full soil profile could not be obtained due to restrictive layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|---|---|
| <input checked="" type="checkbox"/> Surface Water (A1) | <input type="checkbox"/> Salt Crust (B11) |
| <input checked="" type="checkbox"/> High Water Table (A2) | <input type="checkbox"/> Aquatic Invertebrates (B13) |
| <input checked="" type="checkbox"/> Saturation (A3) | <input type="checkbox"/> Hydrogen Sulfide Odor (C1) |
| <input type="checkbox"/> Water Marks (B1) | <input type="checkbox"/> Dry-Season Water Table (C2) |
| <input type="checkbox"/> Sediment Deposits (B2) | <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) |
| <input type="checkbox"/> Drift Deposits (B3) | (where not tilled) |
| <input type="checkbox"/> Algal Mat or Crust (B4) | <input type="checkbox"/> Presence of Reduced Iron (C4) |
| <input type="checkbox"/> Iron Deposits (B5) | <input type="checkbox"/> Thin Muck Surface (C7) |
| <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) | <input type="checkbox"/> Other (Explain in Remarks) |
| <input type="checkbox"/> Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- ☐ (where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes X No Depth (inches): 0
Water Table Present? Yes X No Depth (inches): 0
Saturation Present? Yes X No Depth (inches): 0
(includes capillary fringe)

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Wilcox Superfund Site City/County: Bristow Sampling Date: 9/21/2016
 Applicant/Owner: EPA State: OK Sampling Point: WET4
 Investigator(s): K. Rigney, S. Gilrein Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Hilly Local relief (concave, convex, none): _____ Slope (%): _____
 Subregion (LRR): LRR J (Southwestern Prairies) Lat: _____ Long: _____ Datum: _____
 Soil Map Unit Name: Port fine sandy loam, 0 to 1 percent slopes, occasionally flooded NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil X, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u>	No _____	Is the Sampled Area within a Wetland?	Yes <u>X</u>	No _____
Hydric Soil Present?	Yes <u>X</u>	No _____			
Wetland Hydrology Present?	Yes <u>X</u>	No _____			
Remarks:					

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>25'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. <u>Ulmus rubra</u>	<u>2</u>	<u>N</u>	<u>FACU</u>	
2. <u>Betula nigra</u>	<u>10</u>	<u>Y</u>	<u>FACW</u>	Total Number of Dominant Species Across All Strata: <u>4</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet:
<u>12</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>25'</u>)				Total % Cover of: _____ Multiply by: _____
1. <u>Platanus occidentalis</u>	<u>5</u>	<u>Y</u>	<u>FAC</u>	OBL species _____ x 1 = _____
2. <u>Betula nigra</u>	<u>5</u>	<u>Y</u>	<u>FACW</u>	FACW species _____ x 2 = _____
3. _____	_____	_____	_____	FAC species _____ x 3 = _____
4. _____	_____	_____	_____	FACU species _____ x 4 = _____
5. _____	_____	_____	_____	UPL species _____ x 5 = _____
<u>10</u> = Total Cover				Column Totals: _____ (A) _____ (B)
Herb Stratum (Plot size: <u>5'</u>)				Prevalence Index = B/A = _____
1. <u>Equisetum spp.</u>	<u>15</u>	<u>N</u>	_____	Hydrophytic Vegetation Indicators: _____ 1 - Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 - Dominance Test is >50% _____ 3 - Prevalence Index is ≤3.0 ¹ _____ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. <u>Carex spp.</u>	<u>10</u>	<u>N</u>	_____	
3. <u>Pluchea odorata</u>	<u>5</u>	<u>Y</u>	<u>FACW</u>	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
<u>30</u> = Total Cover				Hydrophytic Vegetation Present? Yes <u>X</u> No _____
Woody Vine Stratum (Plot size: _____)				
1. _____	_____	_____	_____	Remarks:
2. _____	_____	_____	_____	
<u>_____</u> = Total Cover				
% Bare Ground in Herb Stratum <u>70</u>				

SOIL

Sampling Point: WET4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-12	7.5YR3/4	85	2.5YR4/8	15	C	M	sandy loam	
12-16	7.5YR5/2	85	7.5YR3/1	15	C	M	silty sand	darker color was clay

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Sandy Gleyed Matrix (S4) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Sandy Redox (S5) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Stripped Matrix (S6) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Mucky Mineral (F1) |
| <input type="checkbox"/> Stratified Layers (A5) (LRR F) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> 1 cm Muck (A9) (LRR F, G, H) | <input checked="" type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | <input type="checkbox"/> High Plains Depressions (F16) |
| <input type="checkbox"/> 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
 - ☐ Coast Prairie Redox (A16) (LRR F, G, H)
 - ☐ Dark Surface (S7) (LRR G)
 - ☐ High Plains Depressions (F16)
 - (LRR H outside of MLRA 72 & 73)**
 - ☐ Reduced Vertic (F18)
 - ☐ Red Parent Material (TF2)
 - ☐ Very Shallow Dark Surface (TF12)
 - ☐ Other (Explain in Remarks)
- ³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Surface Water (A1) | <input type="checkbox"/> Salt Crust (B11) |
| <input checked="" type="checkbox"/> High Water Table (A2) | <input type="checkbox"/> Aquatic Invertebrates (B13) |
| <input type="checkbox"/> Saturation (A3) | <input type="checkbox"/> Hydrogen Sulfide Odor (C1) |
| <input type="checkbox"/> Water Marks (B1) | <input type="checkbox"/> Dry-Season Water Table (C2) |
| <input type="checkbox"/> Sediment Deposits (B2) | <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) |
| <input type="checkbox"/> Drift Deposits (B3) | (where not tilled) |
| <input type="checkbox"/> Algal Mat or Crust (B4) | <input type="checkbox"/> Presence of Reduced Iron (C4) |
| <input type="checkbox"/> Iron Deposits (B5) | <input type="checkbox"/> Thin Muck Surface (C7) |
| <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) | <input type="checkbox"/> Other (Explain in Remarks) |
| <input type="checkbox"/> Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☒ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes _____ No ☒ Depth (inches): _____
Water Table Present? Yes ☒ No _____ Depth (inches): 12
Saturation Present? Yes ☒ No _____ Depth (inches): 4
(includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

PHOTO LOG

This page intentionally left blank

Wetland Delineation Photographs
Wilcox Oil Company Superfund Site
Photos Taken September 2016



Photograph 1: WUS2 facing west at confluence with WUS1



Photograph 2: WUS2 facing west east of railroad crossing



Photograph 3: WUS3 facing south



Photograph 4: Wetland 1 facing east

Wetland Delineation Photographs
Wilcox Oil Company Superfund Site
Photos Taken September 2016



Photograph 5: Wetland 2 facing southwest



Photograph 6: WUS4 facing northwest



Photograph 7: Wetland 4 facing north

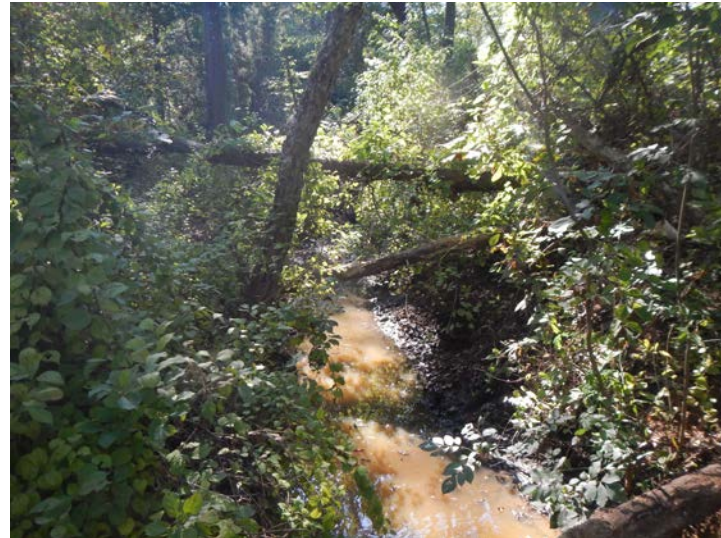


Photograph 8: WUS5 facing south

Wetland Delineation Photographs
Wilcox Oil Company Superfund Site
Photos Taken September 2016



Photograph 9: Overflow replacement between impoundment and WUS5



Photograph 10: WUS6 facing east



Photograph 11: WET3 facing northwest